BLHD5

BLACK LINK HD5

HD Wireless Broadcast System

Kit ensures a stable wireless video, audio and data * (RS-485) transmission in real time (ZERO LATENCY).

3G SDI / HD-SDI
Wireless audio and video transmission in Full HD, 3G

NO COMPRESSION
Uncompressed transmission in resolution up to 1080p/60

ZERO LATENCY
Transferring image at the highest quality with zero latency

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www.camsat.com

Thank you for choosing the Black Link HD5. We are sure that you will benefit from its unique features. Please read this instruction manual to safely operate and to maximize performance.

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I. Safety instructions and Maintenance

To safely use our device, the instructions in this manual must be read and respected.

Safety Symbols

Warning about the possible risk of high voltage exposure caused by the presence of uninsulated dangerous voltage within the product enclosure.

Warning about the importance of specific instructions in manual.

Warning: the device can operate at frequencies and power, which may not be permitted on the territory of selected countries.

The device is easily adaptable to any regional regulations in all fields of exploitation and to meet the requirements of regional and national terms of frequency and law. 5GHz band is divided into different work channels that can be used in each country or region differently. Always check the frequency used and the type of antenna used. You should always check the operating frequency and compliance with the regulations of the region or country where the device is supposed to work.

Safety Instructions

* Before turning on the device antennas must be connected.
* Not using the instructions included in this manual may cause exposure to shock and/or electrical or mechanical hazards.
* Use only the originally approved power supply adapter and use it according to its user guide.
* Do not use the device in wet environment. Contact with water may cause danger of electrical shock.
* Do not close the ventilation gaps.
* For cleaning use dry cloth only.
* Powered on device should be kept min. 30 cm from human body.
* Devices should be kept and used in moderate air moisture and temperature (14–131^{o}F or -10–55^{o}C).
* Device is not supposed to be used outside in adverse weather conditions (rain, snow, ice, etc.)
* Device is not supposed to be used or stored in excessive dust conditions, or high humidity conditions.
* Do not use the device during storm. There is a risk of shock caused by lightning.

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Safety Instructions - continued

* Use only recommended or supplied by Camsat accessories. Using other kind of products may cause worse operating parameters or even damage of device.
* Do not use the product if there is any physical damage to the enclosure.
* Device must not be modified, repaired or disassembled by yourself. In case of any damage or operating problems contact your dealer or CAMSAT directly.
* In case of any unusual situations(like damage, smoke, smell, or other) immediately contact your dealer or CAMSAT office.
* Device may become slightly hot while using. But if temperature of device becomes unbearable to touch, turn off the device and contact our technical support.
* Avoid contact of the device with corrosive materials.
* Avoid contact of the device with fire.
* Do not place this product on an uneven or vibrating surface. It may cause malfunction or damage.
* Compliance is required referring to the voltage, frequency, and current according to the requirements listed on the label and the manufacturer's instructions. Connecting other power source than those specified in the manual may cause improper operation, damage to equipment or in case of not following the restrictions may constitute a fire hazard.
* The operator or user can not replace any part of the device. Service must be provided only by a qualified technician or the manufacturer.

Power supply

1. Producer enables installation of the device in a special V-Lock interface of video cameras, power from the V-Lock battery, and a dedicated power supply. Depending on the destination, a device installed with equipment other than a video camera can cause problems with the device itself or other equipment.
   For more information about the installation of equipment other than the video camera, contact the representative of the manufacturer.

2. It is forbidden to connect battery and AC adapter to Black Link HD5 transmitter or receiver at the same time. This configuration of power can damage the device.

Potential Hazards

* Always obey local signs and law regulations. Using the device in restricted areas may case danger.
* Do not use Black Link HD5 in areas with potential presence of explosive atmospheres. Breaking this restriction may result with fire explosion and injury or even death.
* Usage of Black Link HD5 on petrol or service stations is not recommended. Users are advised to obey all the warning and restriction signs referring to radio equipment in fuel depots, chemical plants or other areas with potential explosion risk.
* Please be cautious with usage of Black Link HD5 in all places with potential danger of explosion (even if area is not marked). It refers to places like: gas stations, below deck on boats, chemical transfer or storage facilities, vehicles using liquefied petroleum gas (such as propane or butane), areas where the air contains chemicals or particles, such as grain, dust or metal powders and any other area where it would normally be advisable to turn off a vehicle's engine.
* Do not use Black Link HD5 near medical or life support equipment that could be influences by radio interference. The Black Link HD5 unit may transmit signals that could interfere with this equipment.

Distances, interferences

1. The transmission distance may vary depending on the frequency, environment, the conditions of radio waves, buildings, weather conditions, etc.
2. When the transmitter is positioned near appliances such as a TV, a wireless network R-LAN, another transmitter or placed between other radio devices this video may not be transmitted correctly or devices may lose the connection. When this happens you should increase the distance between disturbed devices and the transmitter.
3. Signal reception can vary depending on the height and angle of the transmitter. If the reception is not stable you should optimize antennas settings.
4. Meteorological radars operating at frequencies 5250-5350 MHz and 5650-5850 MHz are priority users. These radars could cause interference or prevent its proper operation.

Warning

Antennas used in transmission from this transmitter must be installed in accordance with instruction and should be placed at a distance of at least 30cm from all persons. The transmitter can not be operated in conjunction with any other antenna or transmitter.

II Content

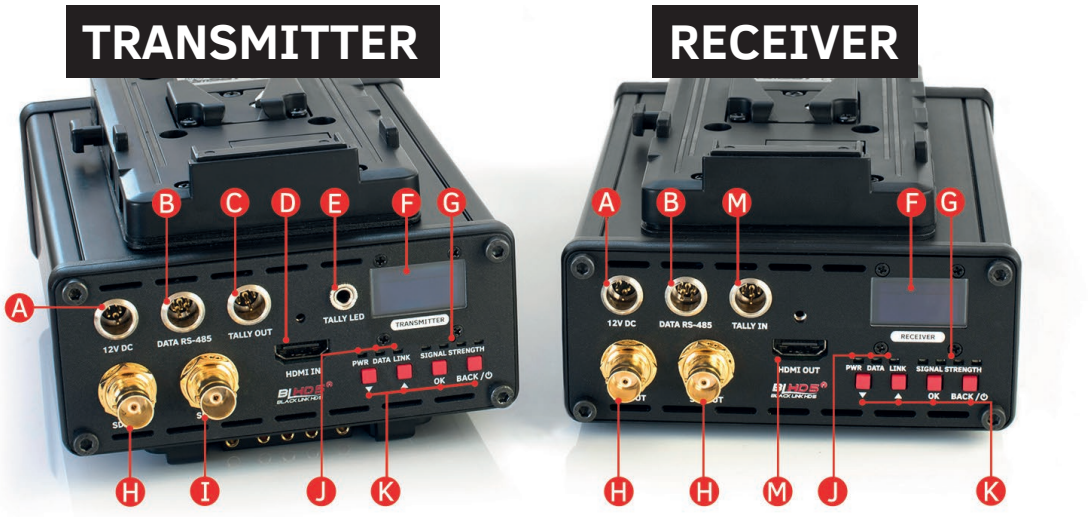
1. Product overview

BLACK LINK HD5 set is an integrated transmission system for image at high HD resolution (1080p, 1080i, 720p) and sound, designed for operators of television cameras HD-TV. The system is characterized by a lack of transmission delay (<1ms) and no image compression. The devices were also equipped with wireless data transmission system RS-485, which can be used to remotely set camera parameters, communication with the director etc.
With TALLY it is possible to inform the camera operator or the person filmed about from which camera signal is transmitted. In addition, the camera operator may be informed about the strength of the radio signal.

Features:

* Supported HD-SDI / SD-SDI input and output.
* Transmitting HD video (1080i, 1080p, 720p) and SD video (525i/625i)
* Supporting SDI embedded audio. (Audio CH1 and CH2 only)
* Transmission delay is less than 1msec.
* Manual selection of transmitted frequencies.
* Power can be supplied either by V-Mount or Anton Bauer type Lithium Ion battery or by EXT DC via XLR 3P connector.
* Two spare ports NO / NC for use according to your needs.

2. Switches, connectors and LED indicators



- A Power connector miniXLR
- B Data RS-485 Socket
- C TALLY Output
- D HDMI IN Socket
- E TALLY LED / LINK LED Socket
- F OLED Display
- G Radio Signal Strength

Very low signal
Low signal
Good signal
Very good signal

- H Power connector miniXLR
- I Data RS-485 Socket
- J TALLY Output

R power (PWR)
G data transmission (DATA)
B indicates the connection between transmitter and receiver (LINK)

- K Controls (K Group)
- L HDMI OUT Socket
- M TALLY IN Socket

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3. Menu - settings

ENTERING MENU

To enter the Menu push and hold **OK**

MENU NAVIGATION

To move through menu use buttons:

▼ down / left ▲ up / right OK select BACK /⏻ back/cancel/stand by

MENU TREE

Channel (operating frequency selection)
Allows to select the requency on which the transmission will be executed. Possible choice of 10 predefined settings or manual frequency selection.

⚠ *The same frequency should be set for transmitter and receiver!*

Video input (signal source selection) *Tx
Selection of socket type (SDI or HDMI), to which signal from camera will be transferred.

Temperature
Information about current device temperature

Settings

Data settings | **
Setting data transmission speed (baud rate) and data format

Tally settings (option available only for receiver in Master mode)
Enables selection of Tally operating mode (Open Collector Mode/Logic) turning it off. Tally turned off causes no signal strength information on receiver and transmitter.

Buzzer settings
Turn on/off the notification of signal losing

RSSI icon set
Setting the signal strength information type

Tx select | *Rx
Select type of transmitter sending signal to receiver

Receiver mode | *Rx
Setting receiver mode . In situation when transmitter sends signal to multiple receivers one of them must operate in **Master mode**, and the rest of them in **Slave mode**

Factory reset
Back to factory settings

Device information
Information about device serial numer

***RX** Option available only in receiver
***TX** Option available only in transmitter
****** Option available in devices with data transmission module

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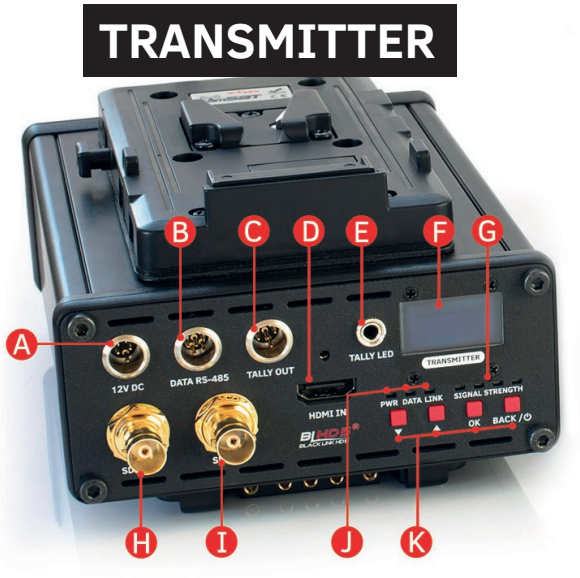
III Kit start up

1. Connection and start-up of the Black Link HD5 transmitter



a) Before switching on the unit connect the BL-AP antennas to the connectors **SMA ANTENNA 1** and **2** and **BL-AD** antenna to the **SMA ANTENNA DATA** connector.

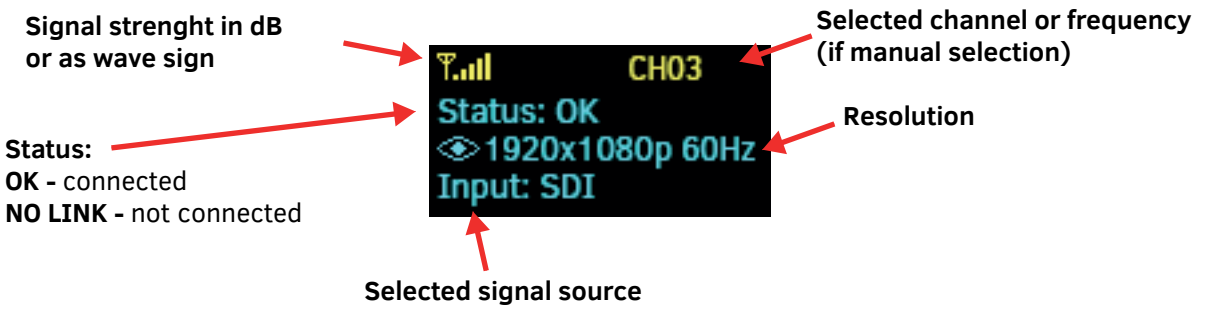
b) Connect the power supply using a battery pack with V-LOCK socket (to power on devices use the switch on the V-LOCK plug) or **AC PX-12/2 12V DC** with mini XLR ending to the socket (unit turns on automatically when you connect power supply).

c) Connect the transmitter to the image transmitting device (camera) to the SDI IN I or HDMI IN D. You can also connect the wires to both sockets I and D , however, the signal will be transmitted to the receiver with only one slot (active slot selected in the menu (See page 7 Main Menu - Video Input).
SDI OUT connector is for example used to connect an external monitor, to which image will be forwarded from the SDI OUT H (active loop through).

d) Set the operating channel (frequency), which will be used for transmission **(See page 7, Main menu - Channel)**.

After turning on the device, the PWR LED lights up, indicating that the device is running.

The screen will show status of:



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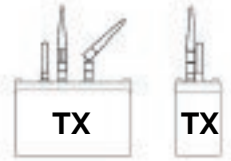
2. Connection and start-up of the Black Link HD5 receiver

a) Before switching on the unit connect the BL-AP antennas to the connectors **SMA ANTENNA 1,2,3,4,5** and **BL-AD** antenna to the **SMA ANTENNA DATA** connector.
b) Connect power using the included AC adapter with the MINI XLR 3P ending to the socket **A** (unit turns on automatically after power).
c) Connect the devices receiving a/v signal to SDI OUT **H** and HDMI OUT **M**. The signal is transmitted in parallel by all slots (no need of active socket selection).
d) Set the operating channel (the same as in the transmitter).

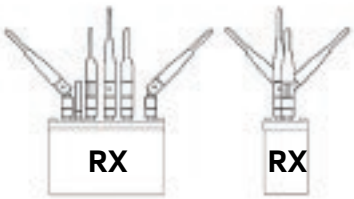
3. Connection and establishing transmission between the transmitter and the receiver

a) Before turning on the device you must connect the antennas first.
b) In order to obtain the highest transmission quality between the transmitter antennas and the receiver it is necessary to preserve the optical visibility (LOS). In the lack of optical visibility of antennas coverage may differ from the nominal.
c) In order to achieve the highest transmission quality it is advisable to keep a minimum distance of 2 meters between devices.
d) The devices must be set to the same channel work.

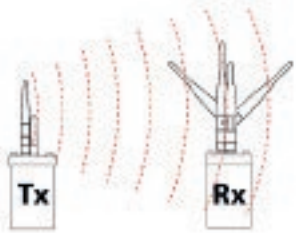
4. Antennas setting in transmitter and receiver



Correct antennas setting in transmitter



Correct antennas setting in receiver



Optimal transmitter position vs. Receiver

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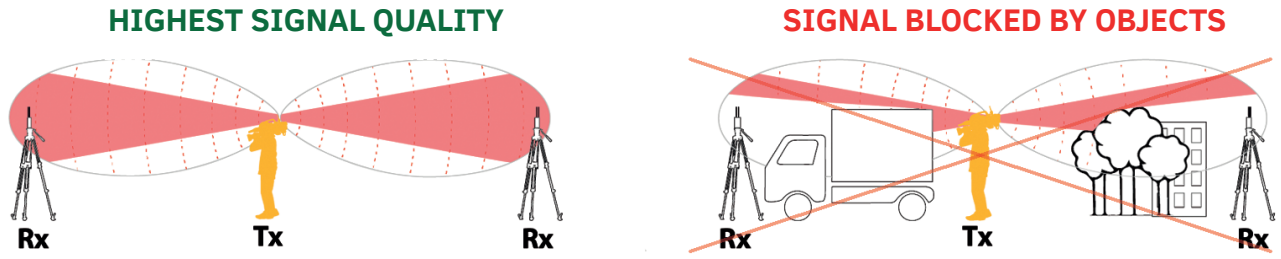
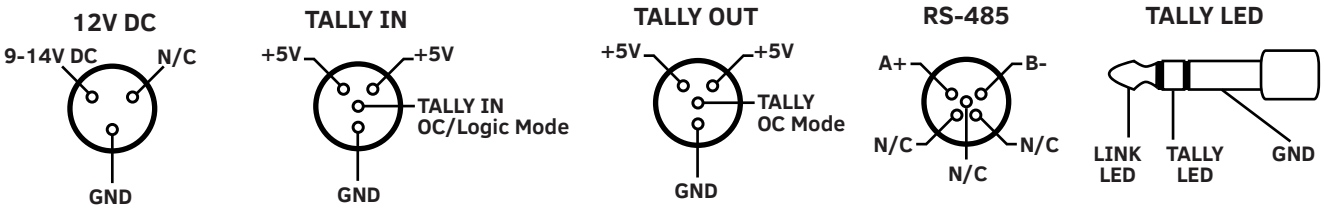
5. Visualization of radio wave propagation

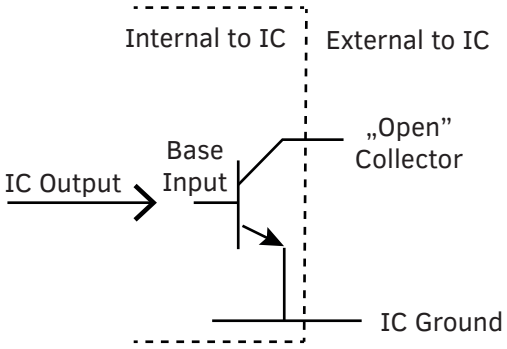


IV Technical specification

1. Connectors schema



TALLY IN
TALLY control input signal operating in two modes (operating mode can be changed in MENU).



a) **Open Collector Mode**
The control is done by connecting or disconnecting inputs (TALLY IN) to ground (GND).

b) **Logic Mode (Logical Mode zero-one)**
Control is done by giving logic one or zero:
- zero = 0V
- one = +5V.

TALLY OUT
Open Collector Output to control the TALLY indicators . The signal is shorted to GND.
Maximum current: 200mA / 12V.

2. Data transmission (RS-485) - specification and frequencies

Table 1 - Specification

Parameter	Description
Modulation	GFSK
Occupied Bandwidth	20 kHz
Distance between the channels	50 kHz
Frequency	from 869,4 to 869,65 MHz
Power	14dBm (25mW)
Data formats	8n1, 8o1, 8e1
Baud rate	4800, 9600, 19200, 38400 [bps]

Table 2 - Frequencies

Frequencies in MHz for video / audio transmission		Frequencies in MHz for data transmission
from	to	
5190	5225	869,40
5230	5265	869,45
5270	5310	869,50
5510	5545	869,60
5550	5585	869,65
5590	5625	869,40
5630	5665	869,45
5670	5705	869,50
5710	5755	869,55
5760	5805	869,60
5810	5835	869,65

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3. Frequency table for video / audio transmission - transmitter BL-HD5610

Channel / Frequencies in MHz	Description	Transmission power	Usage
CH-1 / 5190	Non-DFS	14dBm EIRP (25mW EIRP)	Europe: Indoor only max. 200mW EIRP
CH-2 / 5230	Non-DFS	14dBm EIRP (25mW EIRP)	Europe: Indoor only max. 200mW EIRP
CH-10 / 5755	ISM; Non-DFS	14dBm EIRP (25mW EIRP)	USA: Indoor, outdoor max. 25mW EIRP
CH-11 / 5795	ISM; Non-DFS	14dBm EIRP (25mW EIRP)	USA: Indoor, outdoor max. 25mW EIRP
CH-12 / 5835	ISM; Non-DFS	14dBm EIRP (25mW EIRP)	USA: Indoor, outdoor max. 25mW EIRP
CH - Manual *	Non-DFS	14dBm EIRP (25mW EIRP)	NOTE: These settings use ONLY in accordance with the country / region in which the transmitter is supposed to work.

4. Frequency table for video / audio and data transmission - receiver BL-HD5000

Channel	Frequencies in MHz for video / audio transmission	Frequencies in MHz for data transmission	Description
CH-1	5190	869,40	Only signal receiving
CH-2	5230	869,45	Only signal receiving
CH-3	5270	869,50	Only signal receiving
CH-4	5310	869,55	Only signal receiving
CH-5	5510	869,60	Only signal receiving
CH-6	5550	869,65	Only signal receiving
CH-7	5590	869,40	Only signal receiving
CH-8	5630	869,45	Only signal receiving
CH-9	5670	869,50	Only signal receiving
CH-10	5755	869,55	Only signal receiving
CH-11	5795	869,60	Only signal receiving
CH-12	5835	869,65	Only signal receiving
CH - Manual *	CH - Manual *	Check Table 2 - Frequencies on page 11	Only signal receiving

* CH - Manual – Possibility of using specific channels and frequency ranges (non DFS Mode). Depend on country and region! You should obey the regulations of given country. Do not use this setting if you are not sure what standards are valid in your region.

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5. Technical specifications of the transmitter BLHD5610

TECHNICAL SPECIFICATION - TRANSMITTER	
Video - Audio	
Video input signal	SD-SDI(SMPTE 259M-C) / HD-SDI(SMPTE 292M) HDMI
Audio input signal	SDI Embedded (Embedded Audio CH1,CH2)
Monitoring	SD-SDI/HD-SDI through out
Video Format	HD: 4:2:2 YCbCr 10bit 1080i @ 50/60 Hz, 1080p @ 24/25/30/50/60 Hz 720p @ 50/60 Hz SD: 4:2:2 YCbCr 10bit 525i/59.94, 625i/50
Input / Output	
Video input	BNC ×1 (SD-SDI/HD-SDI) HDMI
Video output	BNC ×1 (SD-SDI/HD-SDI / Loop through out)
Battery input **	V-Mount ×1
DC power output **	V-Plate ×1
Ext-DC input	mini XLR (3 pins) (scheme at page 11) Pin 1: 9-14V DC Pin 2: N/C Pin 3: GND
DATA RS-485 **	mini XLR (5 pins) (scheme at page 11) Pin 1: A+ Pin 4: B- Pin 2,3,5: N/C
TALLY OUT **	mini XLR (4 pins) (scheme at page 11) Pin 1,3: +5V Pin 2: GND Pin 4: TALLY
TALLY LED / LINK LED **	mini Jack 3,5mm (scheme at page 11) 1: Link LED 2: TALLY LED 3: GND
Wireless transmission	
Transmission power	EU Region: Power 14dBm / EIRP
Transmission distance	600m (LOS - Line of Sight)
Transmission delay	No delay (less than 1 ms.)
Transmission format	MIMO / OFDM
Antenna	SMA-RP x 2 + (SMA x 1) *
Link mode	Broadcast
Power	
Power consumption	12W
Power input	12V DC via a 3-pin miniXLR
Power input **	9-14V DC via a battery socket (V-Lock or other)
Power output **	Through-out the DC power only if powered by battery
Product specification	
Dimension	190 × 127 × 54mm / 190 × 127 × 90mm **
Weight	761g / 1020g **
Operating temperature	from -10°C to 55°C
Regulation / Certification	EN 301 489-3 V1.6.1 (2013-08) EN 301 489-17 V2.1.1 (2012-09) EN 301 489-1 V1.9.2 (2012-10) EN 300 440-2 V1.4.1 (2010-08) EN 301 893 V1.6.1 (2011-11) EN 62311:2008 EN 300 220-1 V2.4.1 (2012-05) ** EN 300 220-2 V2.4.1 (2012-05) ** EN 60950-1:2006 + A11:2009 + A1:2010 ** EN 62479:2010 ** RoHS

* - referes to: BL-HD5610-K3 and BL-HD5610-K4
** - referes to: BL-HD5610-K2, BL-HD5610-K3 and BL-HD5610-K4

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6. Technical specifications of the receiver BLHD5000

TECHNICAL SPECIFICATION - RECIVER	
Video - Audio	
Video output signal	SD-SDI(SMPTE 259M-C) / HD-SDI(SMPTE 292M) HDMI
Audio input signal	SDI Embedded (Embedded Audio CH1,CH2)
Monitoring	SD-SDI/HD-SDI through out
Video Format	HD: 4:2:2 YCbCr 10bit 1080i @ 50/60 Hz, 1080p @ 24/25/30/50/60 Hz 720p @ 50/60 Hz SD: 4:2:2 YCbCr 10bit 525i/59.94, 625i/50
Input / Output	
Video output	BNC ×2 (SD-SDI/HD-SDI) HDMI
Battery input **	V-Mount ×1
DC power output **	V-Plate ×1
Ext-DC input	mini XLR (3 pins) (scheme at page 11) Pin 1: 9-14V DC Pin 2: N/C Pin 3: GND
DATA RS-485 **	mini XLR (5 pins) (scheme at page 11) Pin 1: A+ Pin 4: B- Pin 2,3,5: N/C
TALLY IN **	mini XLR (4 pins) (scheme at page 11) Pin 1,3: +5V Pin 2: GND Pin 4: TALLY
Wireless transmission	
Transmission power	EU Region: Power 18dBm / EIRP
Transmission distance	600m (LOS - Line of Sight)
Transmission delay	No delay (less than 1 ms.)
Transmission format	MIMO / OFDM
Antenna	SMA x 5 (Downlink Antenna 1/2/3/4/5) + (SMA x 1) *
Link mode	Broadcast
Power	
Power consumption	12W
Power input	12V DC via a 3-pin miniXLR
Battery mount **	9-14V DC via a battery socket (V-Lock or other)
Power output **	Through-out the DC power only if powered by battery
Product specification	
Dimension	190 × 127 × 54mm / 190 × 127 × 90mm **
Weight	761g / 1020g **
Operating temperature	from -10°C to 55°C
Regulation / Certification	EN 301 489-17 V2.1.1 (2009-05) EN 301 489-1 V1.9.1 (2011-09) EN 301 489-3 V1.4.2 (2002-08) EN 301 893 V1.5.1 (2008-12) EN 300 220-1 V2.4.1 (2012-05) ** EN 301 220-2 V2.4.1 (2012-05) ** EN 60950-1:2006 + A11:2009 + A1:2010 ** EN 62479:2010 ** RoHS

* - referes to: BL-HD5610-K3 and BL-HD5610-K4
** - referes to: BL-HD5610-K2, BL-HD5610-K3 and BL-HD5610-K4

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7. Switches

SWITCHES - OPERATORS IN TRANSMITTER AND RECEIVER	
Led indicators	
Status indicators	RED - power (PWR) GREEN - data transmission (DATA) BLUE - indicates connection between transmitter and receiver (LINK)
Signal strength *	Very low signal ▬ Low signal ▬ ▬ Good signal ▬ ▬ ▬ Very good signal ▬ ▬ ▬ ▬
Operators (K Group) - scheme at page 6	
▼	Down / Left
▲	Up / Right
OK	Enter to menu / Select
BACK /⏻	Back / Stand By
Other switches	
Power switch **	Power ON/OFF

* - referes to: BL-HD5610-K2, BL-HD5610-K3 and BL-HD5610-K4
* - only in transmitters with Data / in every receiver

8. Avalible versions

AVALIBLE SETS OF BLACK LINK HD5				
Set name	BL-HD5610-K1	BL-HD5610-K2	BL-HD5610-K3	BL-HD5610-K4
Half-duplex RS-485 Data Transmission			+	+
TALLY LED			+	+
LINK LED			+	+
Optical and sound out-of-range alerts			+	+
Compatible with V-Lock or Anton Bauer batteries		+	+	+
Transmitter compatible with V-Lock or Anton Bauer camera mount		+	+	+
Receiver compatible with V-Lock or Anton Bauer camera mount				+
Sets includes	- TX BL-HD5610-T1 - RX BL-HD5000-R1 - Ant. BL-AP x 7 pieces - Power Supply CX-12/2 - User manual - Declaration of conformity	- TX BL-HD5610-T2 - RX BL-HD5000-R1 - Ant. BL-AP x 7 pieces - Power Supply CX-12/2 - User manual - Declaration of conformity	- TX BL-HD5610-T3 - RX BL-HD5000-R3 - Ant. BL-AP x 7 pieces - Ant. BL-AD x 2 pieces - Power Supply CX-12/2 - User manual - Declaration of conformity	- TX BL-HD5610-T3 - RX BL-HD5000-R4 - Ant. BL-AP x 7 pieces - Ant. BL-AD x 2 pieces - Power Supply CX-12/2 - User manual - Declaration of conformity

TX - Transmitter
RX - Receiver
Ant. - Antenna

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V General warranty terms

The device is supplied with a standard warranty card. The manufacturer declines all other warranties. In no case the producer is liable for any damages (including, without limitation, consequential, special, or incidental damages, or damages for loss of profits, business interruption, loss of business information or other pecuniary loss) arising out of the use or inability to use this product, even if the manufacturer has been advised of the possibility of such damages.

Camsat grants a 24 month warranty for the Black Link HD5 transmission kit
1. If the device is not be operating properly, make sure, before returning the device for servicing, that everything was done according to the operating manual
2. If the faulty device is returned or send in for repairs, a thorough written description of the signs of the device's faulty operation, including the operating environment and the manner in which they appear, should be enclosed
3. The prerequisite for exercising the warranty rights is enclosing the proof of purchase, including the purchase date and description of damage, with the faulty device
4. Warranty repairs cover only faults occurring due to reasons inherent to the sold device
5. Warranty repairs will be carried out in the shortest possible amount of time not exceeding 14 days, counting from the moment of accepting the device for servicing If parts need to be imported, the repair deadline may be extended After the repairs have been carried out, the warranty period will be extended by the repair time
6. The warrantor is not responsible for the loss of the device configuration settings resulting from device repair or malfunction
7. The warrantor may refuse to carry out warranty repairs or terminate the warranty if it is determined that the seals placed on devices or components comprising it are damaged
8. All repair services resulting from

The warranty does not cover

1. Mechanical damage of devices and failures occurring due to fortuitous events, such as: fire, power grid overvoltage, electrical discharges, power supply, effects of chemical substances.
2. Damage occurring due to: improper handling of the device, using the device against its intended use or the operating manual, customer's negligence, improper use (temperature, humidity, flooding, dust, sanding up, improper power supply voltage)
3. Claims on account of the technical parameters, if they are consistent with those indicated by the manufacturer
4. Marks created during usage, such as scratches, soiling and localised wear are not covered by warranty In cases not regulated by the terms of this warranty sheet, the appropriate provisions of the Civil Code are applicableDevice

VI Device disposal

The mark presented to the left informs that this electrical or electronic device, after its use has ended, cannot be thrown together with household refuse The device should be delivered to a specialised collection point Detailed information about the closest collection point is available from local authorities.

The proper disposal of this device allows for preserving precious resources and avoiding the negative impact on health and environment, which may be endangered if the waste is handled improperly Improper waste disposal is subject to penalties provided for in the appropriate regulations

Hereby, CAMSAT Gralak Przemyslaw declares that the product series Black Link HD5, meets the essential requirements and other relevant provisions of Directive 1999/5 / EC. The device is CE marked, which indicates compliance with the guidelines of the Directive. The device can be sold and used for transmission in the 5 GHz band.
The frequency range can be adjusted using the settings in accordance with legal regulations in every country. It is your responsibility to be adequate settings of the complying with the applicable laws in the country or region.

Warning about the possible risk of high voltage exposure caused by the presence of uninsulated dangerous voltage within the product enclosure.

Warning about the importance of specific instructions in manual.

Warning: the device can operate at frequencies and power, which may not be permitted on the territory of selected countries. You should obey the regulations of given country.

Producer:
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Black Link HD5 User Guide

MADE IN POLAND